Claims

I claim:

1. A metal detector, comprising:

(a) a radio frequency oscillator;

(b) an oscillator coil, the coil being electrically interconnected to the oscillator so as to emit a magnetic field in a region surrounding the oscillator coil;

(c) a first input coil residing within the magnetic field, the first input coil generating a first signal in response to a disturbance of the magnetic field;

(d) a second input coil residing within the magnetic field, the second input coil generating a second signal in response to a disturbance of the magnetic field; and

(e) a signal processor, the signal processor measuring a ratio of the first signal and the second signal so as to determine a physical location of an item causing the disturbance of the magnetic field.

2. The metal detector according to claim 1, wherein the signal processor records a first peak attributable to the first signal and the signal processor records a second peak attributable to the second signal, the signal processor determining a direction of travel of the item causing the disturbance of the magnetic field.

3. The apparatus according to claim 1, wherein the metal detector further comprises:

(a) a case, the case housing the oscillator, the oscillator coil, the first and second input coils, and the signal processor;

(b) a cavity, the cavity residing within the case, the cavity being dimensioned to house a product while being examined for metal contaminants;

(c) a first aperture formed within the case and permitting the product to enter the cavity;

(d) a second cavity, the second cavity being formed within the case and permitting the product to exit the cavity; and

(e) a conveyor, the conveyor transporting the product through the cavity

4. An apparatus according to claim 1, wherein the signal processor associates a disturbance of the magnetic field with a metallic item when the item is determined to reside within the cavity.

5. An apparatus according to claim 1, wherein the signal processor excludes as a potential metallic contaminant an item causing a disturbance of the magnetic field when the disturbance is attributable to a metallic item residing outside of the cavity.

6. An apparatus according to claim 1, wherein the signal processor separates the first signal into a resistive component and a reactive component, and the signal processor separates the second signal into a resistive component and a reactive component.

7. The apparatus of claim 6, further comprising a flux concentrator, the flux concentrator being mounted within the case so as to be adjacent to the cavity, the flux concentrator increasing inductance of the oscillator coil.

8. The apparatus of claim 8, wherein the oscillator coil is formed as first and second adjacent oscillator coils, the first and second oscillator coils being interconnected in a parallel relationship.

9. The apparatus of claim 8, wherein the oscillator coil is formed as first and second adjacent oscillator coils, the first and second oscillator coils being interconnected in a series relationship.

10. A metal detector having a reduced metal free zone, comprising:

(a) an oscillator;

(b) an oscillator coil, the coil being electrically interconnected to the oscillator so as to emit a magnetic field in a region surrounding the oscillator coil;

(c) a first input coil residing within the magnetic field, the first input coil generating a first signal in response to a disturbance of the magnetic field;

(d) a second input coil residing within the magnetic field, the second input coil generating a second signal in response to a disturbance of the magnetic field; and

(e) an input coil voltage monitor, the voltage monitor being electrically interconnected to the first and second input coils, the voltage monitoring calculating an instantaneous ratio between a voltage amplitude of the first signal and a voltage amplitude of the second signal so as to determine a physical location of an item causing a disturbance of the magnetic field.

11. A method of detecting metal, comprising the steps of:

(a) radiating an magnetic field;

(b) simultaneously monitoring a voltage induced by a disturbance of the magnetic field from a first position and a second position; and

(c) calculating a ratio of voltage measured at the first position and the second position; and

(d) determining a location of an item causing the disturbance of the magnetic field based on the ratio of current at each location.

12. The method of claim 11, further comprising the steps of:

(a) placing a product under test within a cavity;

(b) determining if the item causing the disturbance to the magnetic field is located within the cavity; and

(c) categorizing the item as a metallic contaminant when the item is located within the cavity.